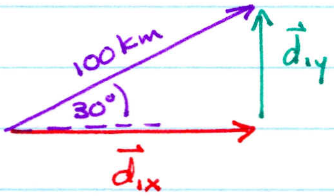
Practice Makes Perfect

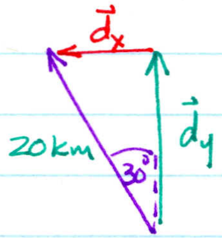
#1



$\vec{d}_{1x} = 100 \cos 30°$
$= 86.6 \text{ km [E]}$

$\vec{d}_{1y} = 100 \sin 30°$
$= 50.0 \text{ km [N]}$

#2



$\vec{d}_x = 20 \sin 30°$
$= 10 \text{ km [W]}$

$\vec{d}_y = 20 \cos 30°$
$= 17.3 \text{ km [N]}$

#3 $\Delta\vec{d}_R = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$

$= 30\text{m [N]} + 20\text{m [N 30° E]} + 20\text{m [S]}$

$= 29.1\text{m [E 70° N]}$

Horiz. ⊕ →

$\Delta\vec{d}_{1x} = \varnothing$

$\Delta\vec{d}_{2x} = 20 \sin 30° \text{ m}$

$\Delta\vec{d}_{3x} = \varnothing$

$\Delta\vec{d}_{4x} = 10 \text{ m}$

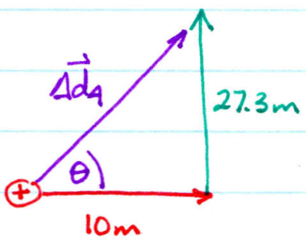
Vertically ↑ ⊕

$\Delta\vec{d}_{1y} = 30\text{m}$

$\Delta\vec{d}_{2y} = 20 \cos 30° \text{ m}$

$\Delta\vec{d}_{3y} = -20\text{m}$

$\Delta\vec{d}_{4y} = 27.3\text{ m}$



$|\Delta\vec{d}_4| = \sqrt{10^2 + 27.3^2}$
$= 29.1\text{m}$

$\theta = \tan^{-1}\left(\frac{27.3}{10}\right)$
$= 70°$

#4 $\Delta\vec{d}_3 = \Delta\vec{d}_1 + \Delta\vec{d}_2$

$= 20\text{ km}\,[\text{N}45°\text{E}] + 10\text{ km}\,[\text{E}30°\text{S}]$

$= 24.6\text{ km}\,[\text{E}21.8°\text{N}]$

Horiz $\oplus \rightarrow$

$\Delta\vec{d}_{1x} = 20\sin 45°\text{ km}$

$\Delta\vec{d}_{2x} = 10\cos 30°\text{ km}$

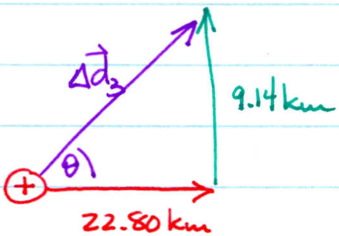
$\Delta\vec{d}_{3x} = 22.80\text{ km}$

Vert. $\oplus \uparrow$

$\Delta\vec{d}_{1y} = 20\cos 45°\text{ km}$

$\Delta\vec{d}_{2y} = -10\sin 30°\text{ km}$

$\Delta\vec{d}_{3y} = 9.14\text{ km}$



$|\Delta\vec{d}_3| = \sqrt{22.80^2 + 9.14^2}$

$= 24.6\text{ km}$

$\theta = \tan^{-1}\left(\frac{9.14}{22.8}\right)$

$= 21.8°$

#5 $\Delta\vec{d}_3 = \Delta\vec{d}_1 + \Delta\vec{d}_2$

$= 200\text{m}\,[\text{N}] + 200\text{m}\,[\text{E}30°\text{N}]$

$= 346\text{m}\,[\text{E}60°\text{N}]$

Horiz. $\oplus \rightarrow$

$\Delta\vec{d}_{1x} = \varnothing$

$\Delta\vec{d}_{2x} = 200\cos 30°\text{ m}$

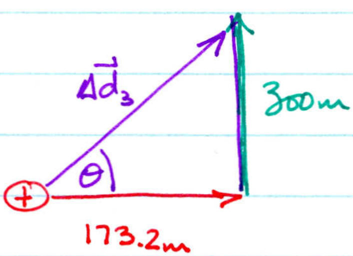
$\Delta\vec{d}_{3x} = 173.2\text{m}$

Vert. $\oplus \uparrow$

$\Delta\vec{d}_{1y} = 200\text{m}$

$\Delta\vec{d}_{2y} = 200\sin 30°\text{ m}$

$\Delta\vec{d}_{3y} = 300\text{m}$



$|\Delta\vec{d}_3| = \sqrt{173.2^2 + 300^2}$

$= 346\text{m}$

$\theta = \tan^{-1}\left(\frac{300}{173.2}\right)$

$= 60°$

#6 $\Delta\vec{d}_3 = \Delta\vec{d}_1 + \Delta\vec{d}_2$

$= 100\text{m [N10°E]} + 200\text{m [W40°S]} = 139\ \cancel{\text{km}}\ \text{[W12.5°S]}$

HORIZ ⊕ →

$\Delta\vec{d}_{1x} = 100 \sin 10°\ \text{m}$

$\Delta\vec{d}_{2x} = -200 \cos 40°\ \text{m}$

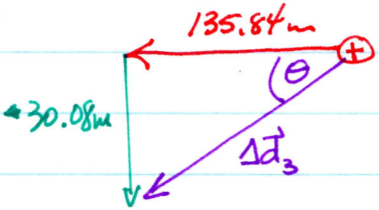
$\Delta\vec{d}_{3x} = -135.84\text{m}$

VERT. ⊕ ↑

$\Delta\vec{d}_{1y} = 100 \cos 10°\ \text{m}$

$\Delta\vec{d}_{2y} = -200 \sin 40°\ \text{m}$

$\Delta\vec{d}_{3y} = -30.08\ \text{m}$



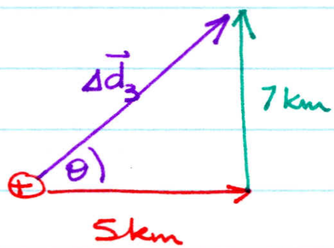
$|\Delta\vec{d}_3| = 139\ \cancel{\text{km}}$

$\theta = \tan^{-1}\left(\frac{30.08}{135.84}\right) = 12.5°$

#7 (a) $\Delta d = 5 + 7 = 12\ \text{km}$

(b) $\Delta\vec{d}_3 = 5\text{km [E]} + 7\text{km [N]}$

$= 8.6\ \text{km [E54.5°N]}$



$|\Delta\vec{d}_3| = \sqrt{5^2 + 7^2}$

$= 8.6\ \text{km}$

$\theta = \tan^{-1}(7/5)$

$= 54.5°$

#8 $\Delta\vec{d}_3 = \Delta\vec{d}_1 + \Delta\vec{d}_2$

$= 20\text{ km [E25°N]} + 45\text{ km [N40°W]}$

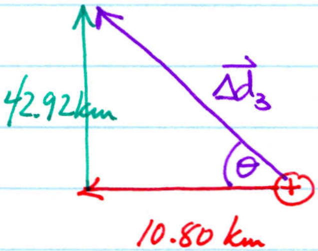
$= 44.3\text{ km [W75.9°N]}$

HORIZ ⊕→ VERT ⊕↑

$\Delta\vec{d}_{1x} = 20\cos 25°\text{ km}$ $\Delta\vec{d}_{1y} = 20\sin 25°\text{ km}$

$\Delta\vec{d}_{2x} = -45\sin 40°\text{ km}$ $\Delta\vec{d}_{2y} = 45\cos 40°\text{ km}$

$\Delta\vec{d}_{3x} = -10.80\text{ km}$ $\Delta\vec{d}_{3y} = 42.92\text{ km}$



$|\Delta\vec{d}_3| = \sqrt{10.8^2 + 42.92^2}$

$= 44.3\text{ km}$

$\theta = \tan^{-1}\left(\frac{42.92}{10.80}\right)$

$= 75.9°$

#9 $\Delta\vec{d}_4 = \Delta\vec{d}_1 + \Delta\vec{d}_2 + \Delta\vec{d}_3$

$= 60\text{ km [S]} + 35\text{ km [N45°E]} + 50\text{ km [W]}$

$= 43.2\text{ km [W54.6°S]}$

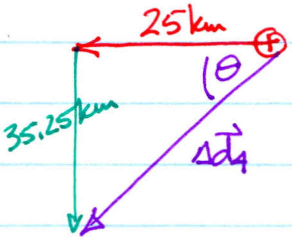
HORIZ ⊕→ VERT ⊕↑

$\Delta\vec{d}_{1x} = \emptyset$ $\Delta\vec{d}_{1y} = -60\text{ km}$

$\Delta\vec{d}_{2x} = 35\sin 45\text{ km}$ $\Delta\vec{d}_{2y} = 35\cos 45\text{ km}$

$\Delta\vec{d}_{3x} = -50\text{ km}$ $\Delta\vec{d}_{3y} = \emptyset$

$\Delta\vec{d}_{4x} = -25\text{ km}$ $\Delta\vec{d}_{4y} = -35.25\text{ km}$



$|\Delta\vec{d}_4| = 43.2\text{ km}$ $\theta = \tan^{-1}\left(\frac{35.25}{25}\right) = 54.6°$